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STATISTICAL DATA FOR THE ELECTRIC LIGHT AND POWER INDUSTRY, 1928

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Statistical Bulletin No. 3

June, 1929

This Bulletin is the third of a series to be issued at intervals for the information of all interested in the electric light and power industry. It has been prepared by the Statistical Department of the N. E. L. A. with the cooperation of the Statistical Committee of the Accounting National Section of the Association.

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STATISTICAL DATA FOR THE ELECTRIC LIGHT AND POWER INDUSTRY FOR THE YEAR 1928

THE statistics herein contained embrace the operations of enterprises devoted exclusively to the generation and distribution of electricity, plus the electric departments of all others which maintained electric light and power systems jointly with other public utility services. These "composite" companies constitute approximately three-quarters of the total number.

These data were determined from reports received at N. E. L. A. headquarters from some 365 companies, whose operations represented approximately 85 per cent of the entire industry and, together with the published returns of municipal systems and of others filed with various Public Service Commissions, were prorated to cover 100 per cent of the total electric light and power business.

Comparison with Previous Statistics

In this Bulletin detailed comparisons have been made with corresponding figures collected by the Association for the years 1927 and 1926 and with those collected by the U. S. Bureau of the Census for 1922.

An effort has been made to account for the entire operations of the electric light and power industry, including the light and power business done by electric railways. In past reports to the U. S. Bureau of Census composite companies operating both power and traction systems in many cases did not separate their light and power business from their traction business, and a certain percentage of the former was therefore included in the Electric Railway Census. For that reason, in comparing these data with census reports, the following percentages are necessary to place them on the same basis:

> 1926, 1927 and 1928: The figures herewith represent 100 per cent of the electric light and power industry.
>
> 1922: Census figures represent 93 per cent of the electric light and power industry.
>
> 1917: Census figures represent 92 per cent of the electric light and power industry.
>
> 1912: Census figures represent 90 per cent of the electric light and power industry.

The forthcoming 1927 Census of the electric light and power industry is expected to separate the operations of the various utility services and, as its schedules are in close similarity with the N. E. L. A. forms, will show figures which are comparable with those outlined in this Bulletin.

Growth of the Industry During 1928

Table I shows the outstanding features of the growth of electric service in the United States during the past year.

The number of domestic consumers increased by 1,163,000 or by 6.5 per cent. This was somewhat smaller than the 1,337,000 increase shown during 1927 or the 1,383,000 shown during 1926. This, however, is in line with expectations, inasmuch as the aggregate of unwired houses is steadily diminishing in urban communities and the number of new customers depends more and more upon new building construction. This in turn is showing increasing signs that the deficiency in housing which originated during the war period is rapidly being overcome.

Electricity used in domestic service has shown the increase of more than a billion kw-hr., reflecting an enlarged use per customer, as well as the growth in their numbers. The total energy used in the country's homes and farms grew, during 1928, by nearly 15 per cent. This is a considerably larger proportionate growth than that shown by commercial service.

TABLE I

SUMMARY—ELECTRIC LIGHT AND POWER INDUSTRY 1922-1928

	1928	1927	1926	1922 (a)	% Increase 1927-1928
Number of establishments* (a)	....	4,327	....	6,355	...
Commercial	....	2,135	....	3,774	...
Municipal	....	2,192	....	2,581	...
Prime movers* (a)					
Number	....	12,007	....	13,242	...
Horsepower	....	35,622,593	....	19,850,860	...
Kilowatt capacity of generators*	27,310,000	25,420,000	23,733,000	14,313,438	7.4
Kilowatt-hours generated	81,868,420,000	74,335,070,000	67,775,212,000	40,291,536,035	10.1
By fuels	49,381,786,000	46,543,740,000	43,247,306,000	....	6.1
Water power	32,486,634,000	27,791,330,000	24,527,906,000	....	16.9
Fuel used, equivalent short tons of coal	42,633,000	41,700,000	40,950,000	....	2.2
Pounds of coal per kw-hr. generated	1.73	1.79	1.89	....	—3.4
Number of customers*	23,235,500	21,834,100	20,329,000	12,709,868	6.5
Domestic customers (including farms)	19,077,000	17,913,900	16,577,400	10,211,232[b]	6.5
Commercial customers and others	4,158,500	3,920,200	3,661,600	2,498,636[b]	5.4
Revenues from sales of electricity to consumers	$1,801,438,000	$1,664,775,000	$1,469,126,000	$940,162,000	8.2
Average revenue per kw-hr. sold	2.64c.	2.70c.	2.65c.	2.79c.	—2.3
Domestic service:					
Average use per consumer, kw-hr	459	429	404	359[c]	7.0
Average annual bill per consumer	$30.10	$29.20	$28.26	$26.50[c]	3.1
Average revenue per kw-hr. sold	6.55c.	6.80c.	6.99c.	7.39c.[c]	—3.7
Percentage of homes served with electricity*	66	63	60	39[b]	4.8

Notes: *As of December 31st.
(a) U. S. Census of Electric Central Stations.
(b) "Electrical World"
(c) N. E. L. A.

TABLE II
GROWTH OF USE OF ELECTRICITY BY ITS CONSUMERS

	1928	1927	Increase	% Increase 1927-1928
Kilowatt-hours Sold to Ultimate Consumers				
For farm service (included below)	(See table VI)	....	....	...
Domestic	8,489,000,000	7,389,000,000	1,100,000,000	14.9
Commercial (small light and power—retail)	11,504,000,000	10,580,000,000	924,000,000	8.7
Commercial (large light and power—wholesale)	41,056,000,000	36,787,000,000	4,269,000,000	11.6
Street lighting	1,525,000,000	1,349,000,000	176,000,000	13.0
Street and interurban railways	4,545,000,000	4,634,000,000	— 89,000,000	—1.9
Electrified steam railroads	562,000,000	481,000,000	81,000,000	16.8
Miscellaneous services	424,000,000	371,000,000	53,000,000	14.3
Total	68,105,000,000	61,591,000,000	6,514,000,000	10.6
Revenues Received from Ultimate Consumers				
Domestic	$555,944,000	$502,743,000	$53,201,000	10.6
Commercial (small light and power—retail)	523,180,000	484,528,000	58,652,000	8.0
Commercial (large light and power—wholesale)	591,195,000	553,834,000	37,361,000	6.8
Street lighting	74,566,000	68,340,000	6,226,000	9.1
Street and interurban railways	42,316,000	43,523,000	— 1,207,000	—2.8
Electrified steam railroads	5,617,000	4,933,000	684,000	13.8
Miscellaneous services	8,620,000	6,874,000	1,746,000	25.4
Total	$1,801,438,000	$1,664,775,000	$136,663,000	8.2

The generation of energy by electric light and power plants increased by 7,543,390,000 kw-hr., or by 10.1 per cent over 1927, and attained the record total of 81,878,420,000 kw-hr.

Generating Capacity, installed in these plants, increased by 1,890,000 kw., or by 7.4 per cent. Of this increase, 1,271,000 kw., or about 67 per cent, was in fuel-using equipment, and 619,000 kw., or about 33 per cent in hydraulic, of which 252,000 kw. was located in one large installation.

All generating plants taken together, the electric light and power industry operated at an average of 35.5 per cent of capacity, as against 34.5 per cent in 1927 and 33.8 per cent in 1926.

Revenue from all classes of consumers increased by $136,663,000, or by 8.2 per cent. This was substantially less than the $195,649,000 increase between the years 1926-1927, and reflects in no small degree the results of the industry's general policy of passing on to the public the benefits resulting from the economies of improved engineering and management.

While a substantial increase in revenue was registered in every classification, it will be noted from Table II that the rate of increase in revenues received from domestic service was much *less* than the rate of increase in kilowatt-hours sold. This is reflected in a notable drop in the average price paid by the domestic consumer. The summary of the industry's growth is outlined in Table I, and a comparison between sales and revenues in the several classes of service follows in Table II.

TABLE III
COMMERCIAL STATISTICS—SALES OF ENERGY

Sales to Ultimate Consumers	No. of Customers	Kw-hr. Sold	Revenue
Farm service (included below, for details see Table VI)	(175,913)	(1,066,764,000)	($19,870,000)
Domestic service (all uses, including non-irrigated farm service)	19,077,013	8,489,332,000	555,944,300
Commercial service			
(a) Small light and power (retail)	3,583,522	11,504,346,000	523,179,900
(b) Large light and power (wholesale, including irrigated farm service)	546,073	41,055,721,000	591,194,800
Municipal street lighting	20,257	1,524,308,000	74,565,600
Railroads—motive power			
(a) Street and interurban railways	461	4,545,022,000	42,316,500
(b) Electrified steam railroads	20	562,160,000	5,617,000
Municipal and miscellaneous	8,105	423,666,000	8,620,200
Total to ultimate consumers	23,235,451	68,104,555,000	$1,801,438,300
Sales for Resale			
Municipal electric distribution systems	751	964,524,000	$12,547,200
Other electric companies			
(a) Sold at points within State lines	1,222	8,471,275,000	68,655,300
(b) Sold at State line for export over State lines	163	3,735,740,000	26,161,800
Total sales for resale	2,136	13,171,539,000	$107,364,300
Grand Total Sales (kw-hr. duplicated by energy sold for resale)	23,237,587	81,276,094,000	$1,908,802,600

Note: Number of customers added during year.

Farm Service Domestic Service	1,163,062
Commercial Service:	
(a) Small Lt. & Pr. (retail)	204,810
(b) Large Lt. & Pr. (wholesale)	30,201
All Others	3,350
Total added during year	1,401,423

Sales of Electricity—Table III

These are presented in tabular form, comparable with figures published in previous statistical bulletins.

The "number of customers" constitutes the total number of locations which involve contractual obligations on the part of the electricity supply systems to render service. The actual interpretation of this term, as well as its distribution between the various classes of service, has been determined by the individual companies reporting.

Figures covering farm service, which are shown on both the N. E. L. A. and the U. S. Census forms, have been included in "domestic service" for service not involving irrigation and under "commercial service—large light and power (wholesale)" for service where irrigation pumping occurs.

Limitations of Certain Statistics

The interlinkage of the various utilities operated jointly within the same organization in the "composite" companies, together with the fact that much of the property is used in common, renders the exact distribution of many items a matter of considerable difficulty and, in the last analysis, often a question of individual judgment on the part of the reporting company.

In addition, the diversity of rate schedules has made it impossible for all companies to render returns exactly conformable to the particular classifications requested in the annual report form and thereby has necessitated some use of estimates for such companies. While calling attention to the desirability of statistical uniformity throughout the industry, it is felt, however, that the comparatively small number of these instances has not entailed any appreciable degree of error in the final results.

It is gratifying to note that an increasing number of companies evidence a willingness to make the separation of their service in accordance with the classifications of the N. E. L. A. and Census schedules.

Trends in Use and Price of Electricity During 1928—Table IV

Reduced to over-all averages, the use of service by the several classes of ultimate consumers in 1928, as compared with 1927, is shown in Table IV.

There has been an increase of 30 kw-hr. in the average amount used by the average domestic consumer, reflecting the continued results of larger appliance use and increased accuracy of reporting. This increase in use more than offsets the comparative falling off in new customers, so that the total number of kilowatt-hours sold for domestic service shows a record gain of 1,100,000,000, or 14.9 per cent over 1927.

TABLE IV
THE AVERAGE ELECTRIC CONSUMER

	In 1928				In 1927			
		Average per Consumer				Average per Consumer		
Class of Service	Average Number of Consumers	Sales Kw-hr.	Revenue	Average Revenue per Kw-hr.	Average Number of Consumers	Sales Kw-hr.	Revenue	Average Revenue per Kw-hr.
Domestic (all uses)	18,495,000	459	$30.10	6.55c	17,219,000	429	$29.20	6.80c
Commercial:								
Small light and power (retail)	3,481,000	3,305	150	4.55	3,326,000	3,076	146	4.58
Large light and power (wholesale)	531,000	77,320	1,113	1.44	539,000	68,243	1,027	1.50
Total commercial	4,012,000	13,100	$285	2.11c	3,864,000	12,555	$268.72	2.19c
Railways	481	.....	......	....	.....	.....	......	0.95
Municipal and miscellaneous (a)	28,000	.....	......	....	27,500	.....	......	4.37
All ultimate consumers	22,535,000	3,022	$79.94	2.64c	21,112,000	2,917	$78.85	2.70c

Note (a) Including street lighting.

Partly because of this enlarged use and partly because of the industry's general policies, the average price of domestic service has declined by 2.5 mills per kw-hr., or by 3.7 per cent during the year, leaving the average revenue per customer only 3 per cent above what is was in 1927. Combining the results of this table with those of the Rate Research Committee and other studies by the Association, the following changes in the cost and use of domestic service have taken place since 1914:

Table V—Domestic Electric Service

Year	Average Use, Kw.-hr.	Average Annual Bill	Average Price Paid Per Kw.-hr.
1914	268	$22.25	8.30c.
1922	359	26.50	7.39
1926	404	28.26	6.99
1927	429	29.20	6.80
1928	459	30.10	6.55

Due, in part, to a general tendency toward lower rates and, in still greater measure, to increased industrial activity over the previous year, the average revenues received per kilowatt-hour sold for commercial purposes showed a slight decline over the rates of 1927. Average revenues from small light and power sales decreased by 0.3 mills, or by 0.7 per cent, and those from large light and power decreased by 0.6 mills, or by 4 per cent.

Rates are constructed to fall with the increase in the quantity used per customer. Thus, in years of prosperity the proportion of power sales in the grand total rises while its average price drops; in years of slackened operations, the proportion of power drops while its average price rises. No argument can therefore be maintained upon the comparative prices, trends or proportions between domestic and commercial electricity, unless the relative industrial activity of the country is considered.

Farm Service—Table VI

The Association has again attempted this year to collect statistics covering the amount of electricity used by agricultural consumers. Table VI shows the kilowatt-hours sold and revenues paid for this energy as recorded by those companies which were able to report farm service as a separate classification. This table may, therefore, be considered merely as a cross-section of rural electric service. It does not show the totals for the entire country, as the bulk of the business is still included by many companies under the single classification of "domestic service."

Farm service in the United States is broadly divisible into two distinct classifications: (a) service on irrigated lands

TABLE VI
FARM SERVICE AS INDICATED BY 125 COMPANIES REPORTING

Classification	Number of Customers Reported	Kilowatt-hours Sold	Revenue	Annual Average per Customer Kw-hr. Sold	Annual Average per Customer Revenue	Average Revenue per Kw-hr. Sold
Farms involving irrigation	68,811	1,007,144,000	$15,510,000	17,000	$263.50	1.55c
Farms not involving irrigation	107,102	59,620,000	4,361,000	674	49.20	7.30c
Total	175,913	1,066,764,000	$19,871,000	......	......	....

In the preparation of Table III (commercial statistics—sales of electricity), farm service not involving irrigation, as set out above, has been included in "domestic service" while farm service involving irrigation has been included in "commercial service—large light and power (wholesale.)"

and (b) service on non-irrigated lands. The first classification applies to practically the entire country west of the 100th meridian (i. e., the Pacific and Mountain States, plus the western parts of the Plains States, roughly outlined by the "dead line" of 20-inch rainfall of old pioneer days) and to the States of Texas, Arkansas and Louisiana. The second classification embraces the rest of the country, although the increased use of electric-pumps for irrigation is generally noted not only in semi-arid regions but also in those of considerable (though seasonal) rainfall. For the reason that irrigation pumping is an item of such magnitude as to completely mask all other agricultural operations, Table VI has been set up in two divisions, the second one of which is representative of the average performance of the average farm.

It is gratifying to note, and is of hopeful significance for the future, both of agriculture and of the electric light and power industry, that, as reported by the 125 companies that have been able to keep separate records of their actual performance, the use of electricity per farm is already considerably in excess of urban domestic requirements.

TABLE VII
SOURCE AND DISPOSAL OF ENERGY

Source of Energy		Kilowatt-hours
Generation—		
By fuels		49,381,786,000
Water power		32,486,634,000
Total generation (net)		81,868,420,000
Energy from Other Sources—		
Excess of imports from Canada over exports (a)	1,157,624,000	
Net energy received from various Federal, State, and District projects and from industrial plants	1,269,383,000	
Total energy from other sources		2,427,007,000
Total energy available for distribution		84,295,427,000
Disposal of Energy		
Sales to ultimate consumers (see Table II)		68,104,555,000
Used in electric railway department	1,341,780	
Used in other departments	1,128,544	
Total company use		2,470,324,000
Total accounted for		70,574,879,000
Balance unaccounted for (losses, etc.)		13,720,548,000
Total energy distributed		84,295,427,000
INTER-UTILITY TRANSACTIONS		
Purchased or Transferred Energy Received		
Imported from Canada (a)	1,356,453,000	
Received over State lines	9,080,000,000	
From other electric companies within State lines	10,167,565,000	
From other sources (manufacturing plants, public works, etc.)	1,269,383,000	
Total energy received		21,873,401,000
Energy Sold or Transferred for Resale		
Exported to Canada	198,829,000	
Exported over State lines	9,080,000,000	
To municipalities within State lines	964,524,000	
To other electric companies within State lines	9,203,041,000	
Total energy for resale		19,446,394,000
Net energy received from other sources		2,427,007,000

Source and Disposal of Energy—Table VII

Of the total energy available during the year 1928 for distribution to the public, 58.4 per cent was generated by fuels and 38.5 per cent by water power. The balance, or 3.1 per cent, was imported from Canada or received from Federal, State and District hydro-electric projects or from industrial enterprises which were not public utilities. These figures show a rise in the proportion of water power in the total of distributable energy, which is the result, in part, of a year of comparatively more copious rainfall and of better stream flow and, in part, of the commencement of operations of one very large new hydro-electric installation. Due, however, to the increasing efficiency of steam-electric generation and to the numerous economic factors which follow in its train, it is to be doubted that this represents a trend which will persist.

Fuel Used in Electrical Generation, Table VIII

Table VIII gives a summary of the fuel used by all the electric light and power plants of the country during 1928. These produced 49,392,000,000 net kw-hr. through the consumption of fuel equivalent to 42,633,000 short tons of coal. This indicates an average net use of 1.73 pounds of coal per net kw-hr. generated, as against an average of 1.79 pounds in 1927 and of 1.89 pounds in 1926.

TABLE VIII
FUEL USED FOR ELECTRICAL GENERATION—1927

Coal (anthracite and bituminous, in short tons)	37,616,000
Oil (in 42 gal. bbls.)	6,834,000
Gas (in 1000 cu. ft.)	76,903,000
Total fuel (including small amounts of fuels not shown above) in equivalent short tons of coal	42,633,0[illegible]
Energy generated by use of fuels	49,382,000,0[illegible] kw-hr.
Pounds of coal (or its equivalent) per kw-hr.	1.73 [illegible].

Transmission Lines, Table IX

Table IX shows the circuit miles of transmission lines of companies reporting to the N. E. L. A., grouped according to their major classifications. In addition, there are shown the individual voltages in most common use, as reported by identical companies during the past three years, and a comparison of the proportion of lines carrying these voltages to the total mileage. Of the voltages in most common use, the largest rate of growth is indicated in lines carrying 66,000 volts, which now comprise 15 per cent of the total mileage. It is gratifying to note that there is a steady trend toward the adoption of voltages recommended as standard and a corresponding decline in the proportion of lines carrying odd voltages.

Sales of Merchandise—Table X

Table X shows the total gross receipts from sales of the merchandising departments of the electric light and power companies of the country. The grand total of $119,330,000 is nearly $20,000,000 more than the $99,866,000 reported last year. Of the total business done, 8.9 per cent was in lamps, 76.5 per cent in appliances, while the balance was in jobbing and miscellaneous electric sales. These ratios are substantially unchanged from last year.

TABLE X

GROSS SALES OF MERCHANDISE—1928

Electric lamps	$10,610,000
Electric appliances	91,960,000
All other electric sales	16,760,000
Total	$119,330,000

TABLE IX

TRANSMISSION LINES OF COMPANIES REPORTING TO N. E. L. A.

Voltage (U. S. Census Classifications)	Circuit Miles 1928	Circuit Miles 1927
11,000 but under 33,000 volts	49,745	48,587
33,000 but under 66,000 volts	48,405	41,171
66,000 but under 110,000 volts	24,378	22,244
110,000 but under 220,000 volts	16,016	14,699
220,000 volts or more	2,980	1,257
Total	141,524	127,958
Estimated national total	150,000	......

VOLTAGES IN COMMON USE

(For Identical Companies Reporting by Voltages in 1926, 1927 and 1928)

Voltage	1928 Number of Companies Reporting	1928 Circuit Miles Reported	Per Cent of Total Reported 1928	Per Cent of Total Reported 1927	Per Cent of Total Reported 1926
220,000**	3	1,590	1.4	1.2	1.2
132,000**	34	3,878	3.5	3.7	2.9
110,000*	32	7,577	6.8	7.4	7.9
66,000**	79	16,943	15.3	14.5	13.8
60,000	16	6,316	5.7	6.1	5.3
44,000*	24	5,503	5.0	5.4	5.3
33,000**	95	19,191	17.3	17.4	18.3
22,000*	66	6,341	5.7	6.2	5.1
13,200**	63	11,976	10.8	10.0	10.9
11,000*	58	7,176	6.5	5.9	5.8
All other voltages above 11,000	147	24,425	22.0	22.2	23.5
Total reported	617	110,916	100	100	100

*Recognized as in common use by the International Electrotechnical Commission.

**Preferred for standard by United States National Committee of the International Electrotechnical Commission.

New Construction—Table XI

Table XI gives the distribution of actual 1928 construction expenditures and the budget for 1929, as estimated for the total electric light and power industry. These are substantially the same as in previous years. The proportion of expenditures for hydro-electric generation is showing a steady decrease from 8.7 per cent in 1927 to 8.1 per cent in 1928 and 7.5 per cent proposed for 1929.

It will be noted that the sums devoted to power plant construction comprised in 1928 about 25½ per cent of the total; for transmission lines and substations about 31 per cent; while expenditures for the distribution system took up about 28 per cent, or more than that devoted to generation.

TABLE XI

1928, 1927 AND 1926 CONSTRUCTION EXPENDITURES AND BUDGET FOR 1929 TOTAL ELECTRIC LIGHT AND POWER INDUSTRY

	1928 Gross Construction Expenditures	1929 Budget	1927 Gross Construction Expenditures	1926 Gross Construction Expenditures
Steam generating stations	$136,500,000	$160,600,000	$156,360,000	$189,058,000
Hydro generating stations	56,300,000	64,000,000	69,268,000	47,399,000
Substations	107,000,000	112,700,000	118,877,000	121,019,000
Transmission	125,100,000	147,200,000	140,573,000	115,946,000
Distribution	211,800,000	241,800,000	219,962,000	206,209,000
Miscellaneous electric	116,800,000	64,100,000	88,704,000	92,884,000
Total for electric operations	$753,500,000	$790,400,000	$793,744,000	$772,515,000